ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

FIELAX

Surface T/S Data RV "Heincke"

HE477

Data Processing Report

Contents

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1 Introduction

This report describes the processing of raw data acquired by the thermosalinograph on board RV "Heincke" during expedition HE477 to receive cleaned up and drift corrected salinity data.

2 Workflow

The different steps of processing are visualized in Figure 1. Unvalidated data of sensor, internal and external temperature are extracted from the DAVIS SHIP data base (https://dship.awi.de) in a 1-second interval. The Salinity was calculated by applying the Practical Salinity Scale 1978 (PSS-78). Furthermore the sound velocity was derived by using the Del Grosso equation.
As a first step, a basic cleanup was performed to remove missing or flagged data. Then, too low flow rates are taken as indicator for an unproper usage of the thermosalinograph. Since the salinity measurements in coastal areas (e.g. rivers and ports) are less reliable, measurements in a buffer of 2 nautical miles (NM) along the coast are filtered. In the norwegian area (fjords) the buffer is set to 200 meters (0.108 NM). After the exclusion of data outside the speed interval of 0.5 kn to 15 kn, the salinity is driftcorrected with lab calibration data. After despiking, a visual screening is performed to enhance the data quality. In the last step the temporal resolution is reduced to 5-minutes-means.

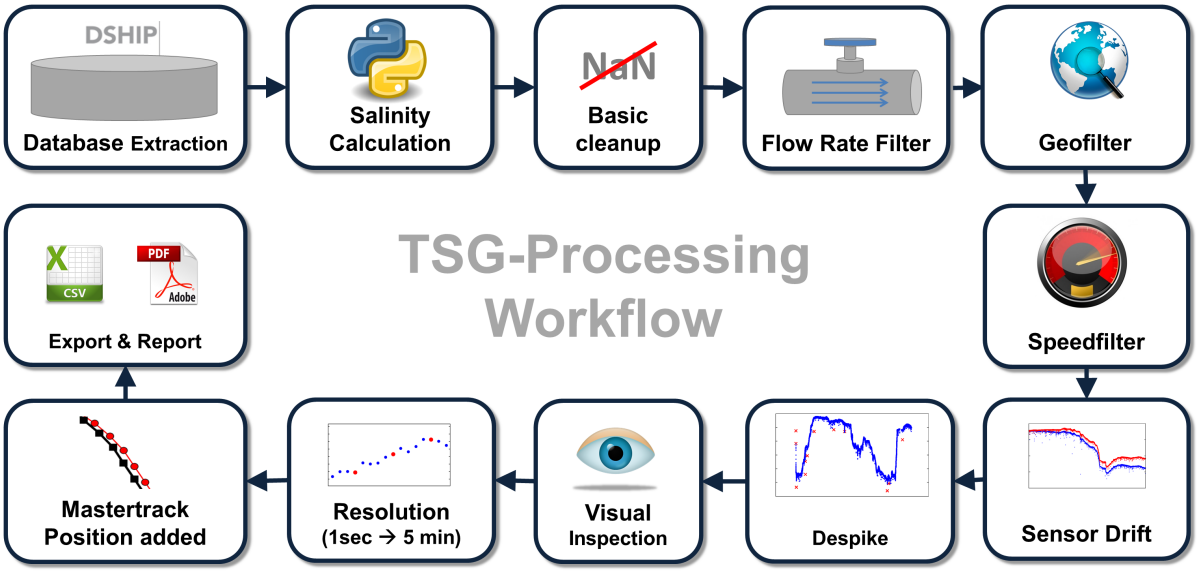

Figure 1: Workflow of TSG data processing

3 Cruise details

Vessel name	RV "Heincke"
Cruise name	HE477
Cruise start	13.02.2017 Bremerhaven
Cruise end	27.02.2017 Bremerhaven
Cruise duration	15 days

4 Sensor

Thermosalinograph:	Seabird SEACAT SBE21 (SN: 3333)
External Temperature:	SBE38

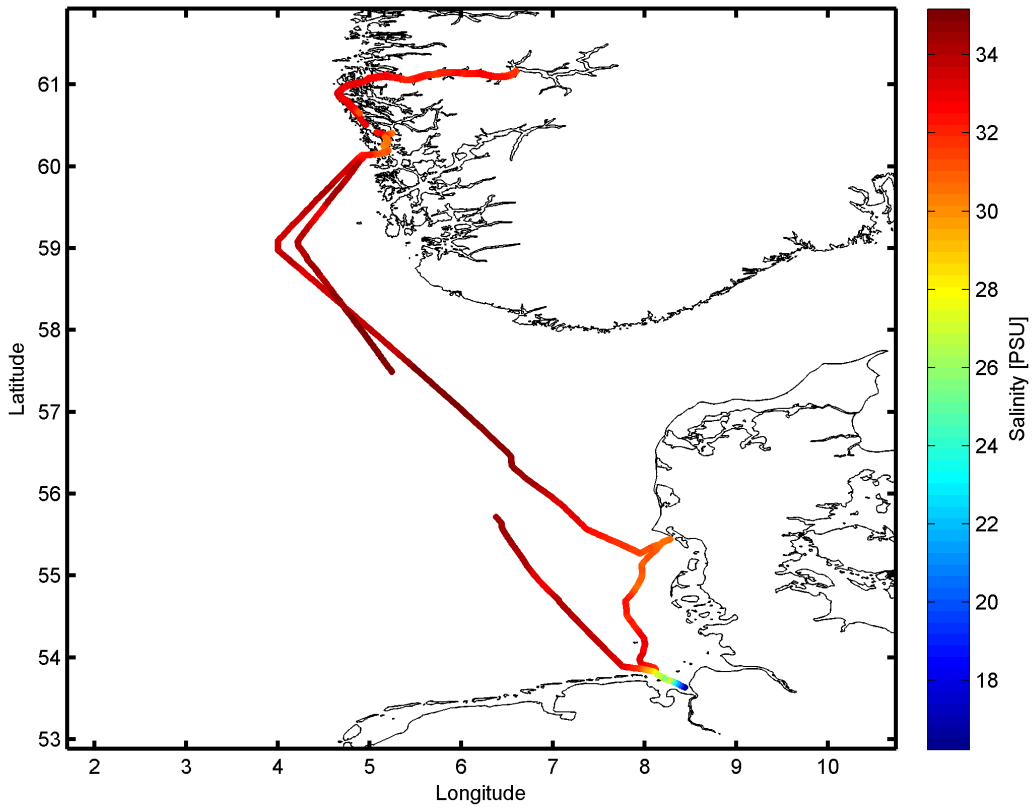

Figure 2: Cruisemap of HE477.

5 Processing Report

Database Extraction

Data source	DSHIP database (dship.awi.de)
Exported values	1296000
First dataset	2017-02-13T00:00:00 UTC
Last dataset	2017-02-27T23:59:59 UTC

Automatic Validation

The following thresholds were applied for the automatic flagging of the position data:

Min. flow rate	Minimum 2.5
Min. speed	Minimum 0.5 kn between two datapoints.
Max. speed	Maximum 40 kn between two datapoints.
GeoBuffer	0.1080 NM around Norway, 2 NM anywhere else

Flagging result

Filter	Data left (abs.)	Data left (rel.)	Data removed (abs.)	Data removed (rel.)
Raw data	1296000	100 %	—	—
Basic	369275	28.49 %	926725	71.51 %
Flow rate	302393	23.33 %	993607	76.67 %
Geo	269354	20.78 %	1026646	79.22 %
Speed	264155	20.38 %	1031845	79.62 %
Despike	264051	20.37 %	1031949	79.63 %
Manual	264014	20.37 %	1031986	79.63 %
5-min-Mean	3275	0.25 %	1292725	99.75 %

Sensordrift

Last calibration	31.05.2016
Current calibration	05.09.2017
Start of deployment	01.12.2016
End of deployment	07.07.2017
Scaled drift	8.0923e-004 [PSU/month]
Minimal offset	1.9688e-003 [PSU]
Maximal offset	2.3678e-003 [PSU]

Comments

Sensor No. 3333 exchange ahead from schedule due to broken conductivity cell. No reasonable post cruise calibration possible.

Process evolution

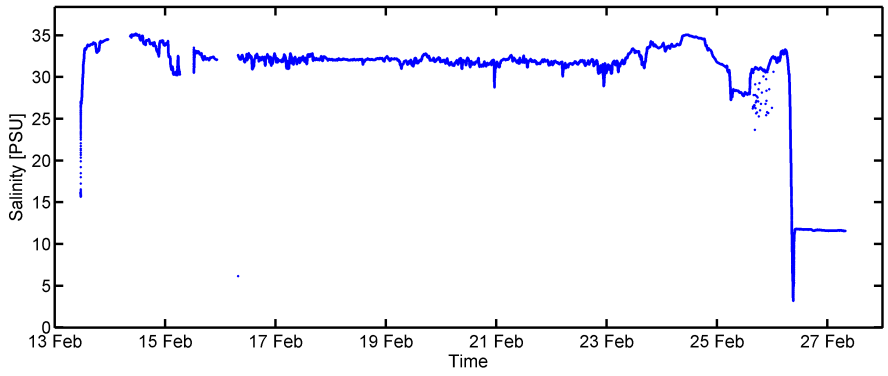

Figure 3: Raw salinity data.

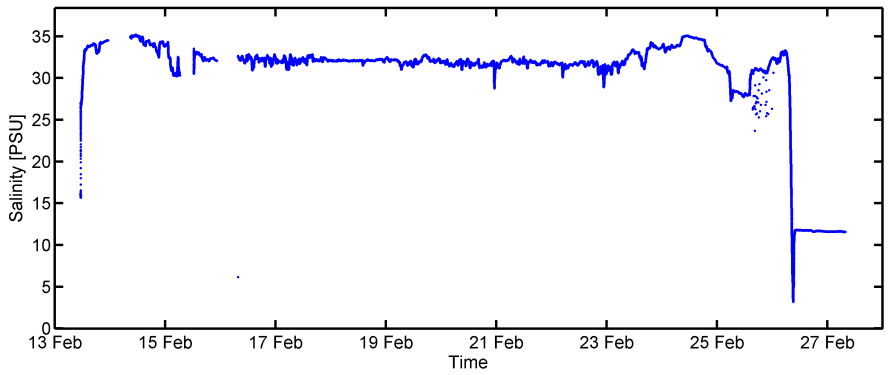

Figure 4: Salinity after basic filter.

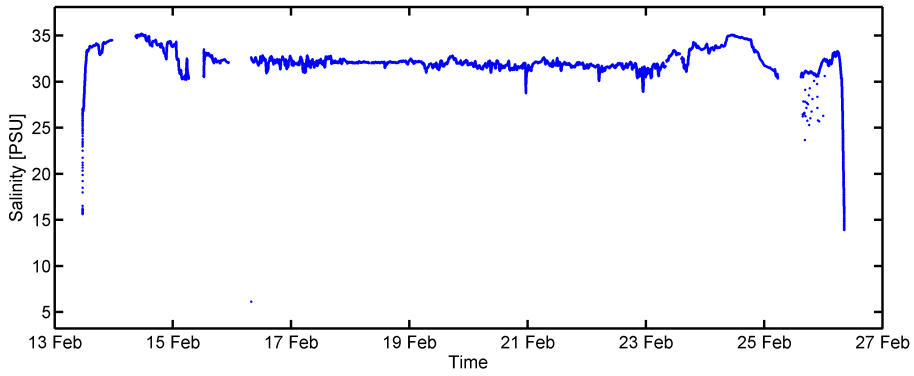

Figure 5: Salinity after flow rate filter.

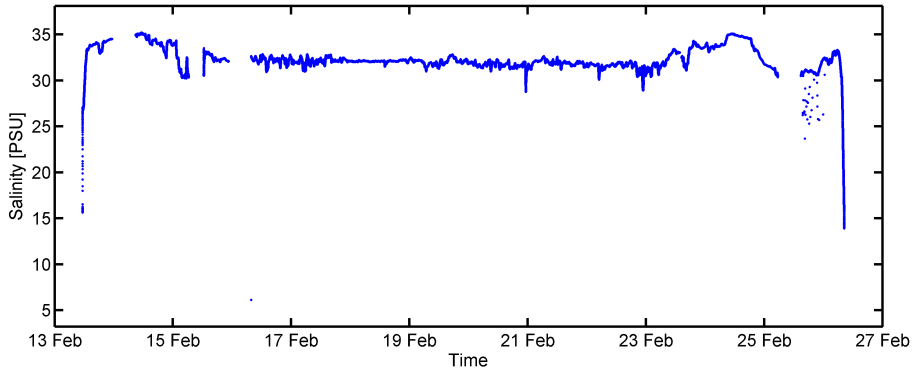

Figure 6: Salinity after geofilter.

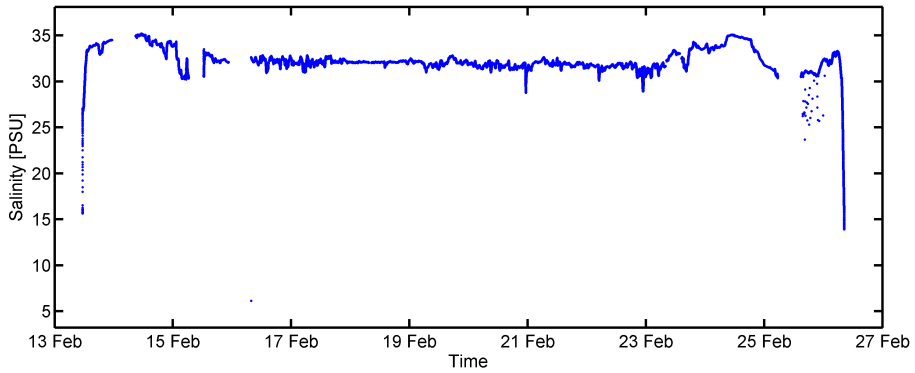

Figure 7: Salinity after speed filter.

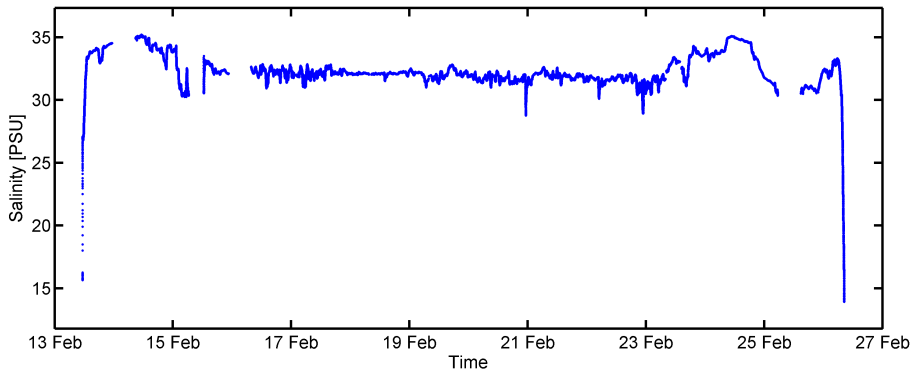

Figure 8: Salinity after despike.

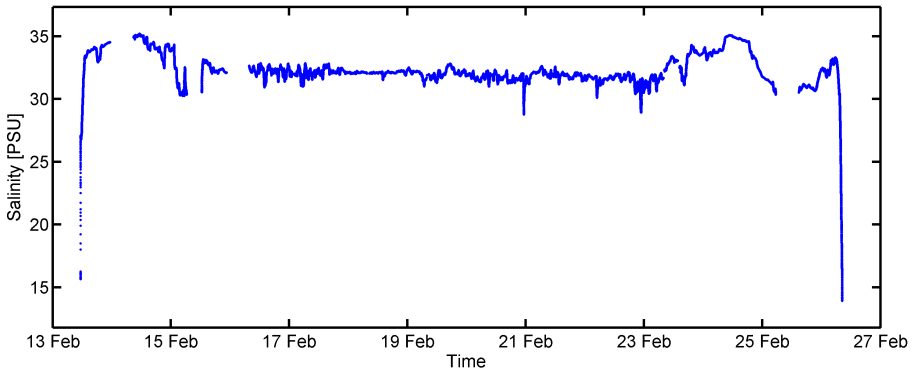

Figure 9: Salinity after manual filter.

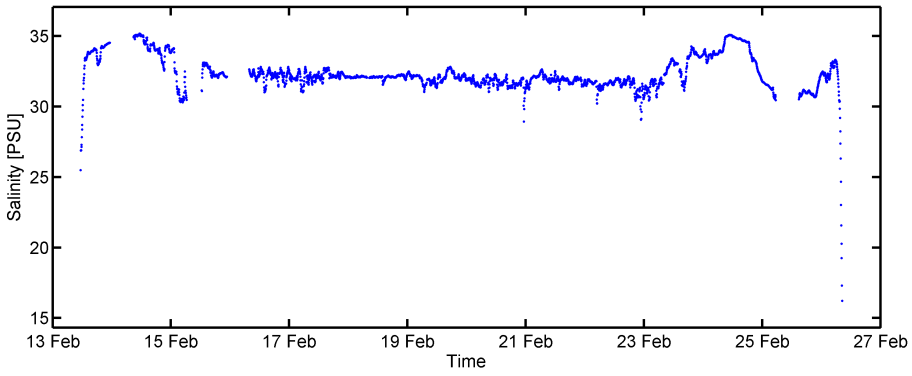

Figure 10: Salinity in 5-min-mean values.

Result file

Text File (HE477_surf_oce.tab):

The format is a plain text (tab-delimited values) file.

Column separator	Tabulator "\t"
Column 1	Date and time expressed according to ISO 8601
Column 2	Latitude in decimal format, unit degree
Column 3	Longitude in decimal format, unit degree
Column 4	Depth below water surface, unit meter
Column 5	Temperature, unit degree
Column 6	Salinity, unit PSU

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This PDF document.